

Introduction to Whole System Thinking for Communities

Community leaders could use some help. They are confronted with increasingly complex problems requiring a wide range of technical knowledge. Also, citizens seem more on edge; and they're demanding results.

As we suffer the unintended consequences of many earlier decisions, it's becoming clear that some of those decisions didn't dig deeply enough or account for long-term effects. They seem to have focused narrowly, only treated symptoms, missing the underlying causes that persist today.

This old pattern can be reversed by whole-system thinking , which accounts for complexity and long-term effects, and that digs deep to target causes. It's a way to tackle problems that is far more likely to lead to durable solutions. It's a way to design solutions that work better and are better for the environment. It's the practice of identifying and understanding the relationships among a system's parts, rather than just the parts themselves, in order to solve important problems.

Whole-system thinking is not new. Expressions such as "He can't see the forest for the trees," "the whole is greater than the sum of its parts," "vicious circle," and "thinking outside the box," affirm that being able to see the big picture has long been regarded as important. But our industrial past pushed society away from thinking in

terms of entire systems. Highly skilled decision-makers and designers often define problems too narrowly, without identifying their causes or connections, which merely shifts or amplifies problems.

In fact, many of the biggest problems facing the world—war, hunger, poverty, and environmental degradation—are essentially system failures. They cannot be solved by fixing one piece in isolation from the others, because even seemingly minor details have enormous power to undermine the best efforts of too-narrow thinking.

Take cars, for example: Driven by complexity, automotive engineers and designers tend to specialize. One person's job is to make a given component or subsystem the best it can be. As a result, the modern automobile has evolved, through an incremental process of small improvements to individual components, without much change to the overall concept. Specialization and incrementalization has stifled sweeping innovation and possibly led to loss of market share. The problem with blind specialization is that optimizing isolated parts often "pessimizes" the greater system—complexity, over-sizing, and inefficiency abound. With cars, that means unnecessary fuel costs and air pollution.

This kind of "silo" thinking limits opportunities, innovation, and

creativity. In contrast, whole-system thinking cuts across occupations, departments, and disciplines — typically revealing smarter, integrative-design solutions that transcend ideological and turf battles and unite all parties around shared goals.

A local example of silo thinking takes place among the plethora of public service jurisdictions found in most communities. For example, sewer systems, run by sewer district boards, are profoundly affected by water-district and county decisions, but controlled by different people who seldom, if ever, talk to one another. Sewer district board members often fail to understand the goals and challenges of the county as it approves new subdivisions or the water district as it expands capacity. Instead, the board treats symptoms by adding sewer capacity and raising taxes to pay

for it, claiming it's just responding to demand over which it has no authority.

Symptom fixes are often attractive to decision makers because they tend to be visible, often dramatic, fast acting, and apparently logical. They make decision makers look good ... in the short run. In sharp contrast, solutions that address causes are often less intuitive, less dramatic, slower to take effect, and sometimes more difficult to measure. They require courageous and creative leaders who collaborate and consider whole systems.

Though whole-system thinking is often well served by technical information, participating does not necessarily require technical background. Anyone can do it.

Why use whole-system thinking?

Because it:

- Is a practical way to tackle complex issues
- Addresses causes, not just symptoms
- Integrates economic, environmental, and community factors
- Avoids risks, costs, and unintended consequences
- Derives solutions that are more durable, resilient, and likely to be supported by a wider range of people

Whole-system thinking requires ingenuity, intuition, and collaboration among people with different concerns, experiences, and expertise.

Whole-System Design Principles for Communities

Use these principles iteratively, not linearly. This is not a checklist. As you dive into your problem-solving efforts, review each principle to seek a new perspective or approach to your problem.

Regarding your problem-solving process:

1. **Collaborate** with people who bring the complete range of expertise, experience, concern, and influence to the table.
2. **Define shared goals** and return to them throughout the process.
3. **Solve the right problem** by asking the right questions; seek systemic causes of the problem by asking why.
4. **Examine assumptions** related to the problem and the people involved in it.
5. To determine the facts, especially those that are disputed, **use real data** from mutually satisfactory sources.
6. **Optimize the whole system, not just individual parts.** (Contrary example: The sewer district manager regards his responsibility as black water, not clean water. He says that city decisions that increase water flowing into the sewer system are not within his authority, that he's just obligated to clean the results.)
7. **Start with a clean sheet.** While solving complex problems, we often reproduce similar problems by starting with a previous or familiar approach. To avoid catching “infectious repetitis,” cultivate a “beginner’s mind” even when time, cost or other pressures abound. Set aside all conventional methods and assumptions, and jump to a completely new approach with no preconceptions.
8. **Reward desired outcomes.** Ensure that your organization rewards its people for taking the time to find whole-system solutions.

Regarding prospective solutions:

9. **Design durable solutions;** integrate economic, community and environmental factors—not benefiting one at the expense of the others.
10. **Consider long-term effects and unintended consequences**—positive and negative (using what-if questions).
11. **Explore potential barriers,** for example, institutional barriers. Include solutions to the barriers in the overall solution.

Regarding selected solutions:

12. **Identify multiple benefits** from single solutions in order to widen support.

13. **Include feedback** in the design of your solutions. Feedback will support future efforts to refine the solution.

Conventional Thinking	Whole-System Thinking & Integrative Design
Big problems require big solutions	Many big problems can be solved with several small integrated solutions
Problems are a burden	Many problems are opportunities
Centralized solutions	Distributed solutions
Optimize my portion of the system, the part I understand, and from which I benefit	Optimize the whole system
Processes are linear	Processes are cyclical, with closed loops
One problem requires one solution	Problems are interconnected, so are solutions
Nature supplies raw materials	Nature supplies raw materials <i>and</i> services
Waste = Problem to throw away	Waste = Food; there is no “away”
Prosperity requires perpetual expansion	Prosperity requires increased diversity, resource efficiency, & waste minimization.
Prosperity requires continuously increasing gross throughput	Prosperity is increased net benefit
Fix symptoms	Address causes too
Economies of scale	Economies of systems
Economy is independent of Nature	Economy is a subset of Nature
Short term	Long term
Solutions generate individual benefits	Solutions generate multiple benefits
Smart, powerful individuals are the best sources of solutions	Collaboration among people with diverse knowledge & interests derives effective solutions
Leaders push the right answers	Leaders ask the right questions
Leaders talk	Leaders listen

Note that many of these principles were derived from the Principles of Factor Ten Engineering, developed by Amory Lovins, Rocky Mountain Institute, and the author of this paper

Resources for further exploration

[Factor Ten Engineering](http://www.rmi.org/rmi/10xE) (www.rmi.org/rmi/10xE) for those who would like to see whole-system thinking at work in the design of resource-intensive facilities and products

Autodesk Sustainability Workshop is an entertaining yet serious exploration of whole-system thinking

Consilience: The Unity of Knowledge, by Edward O. Wilson

Green Metropolis: Why Living Smaller, Living Closer, and Driving Less are the Keys to Sustainability, by David Owen

Leverage Points: Places to Intervene in a System, by Donella Meadows

Limits to Growth, by Dennis Meadows, Donella Meadows, and Jorgen Randers

Natural Capitalism: Creating the Next Industrial Revolution, by Paul Hawken, Amory Lovins and L. Hunter Lovins

Thinking in Systems, by Donella Meadows

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